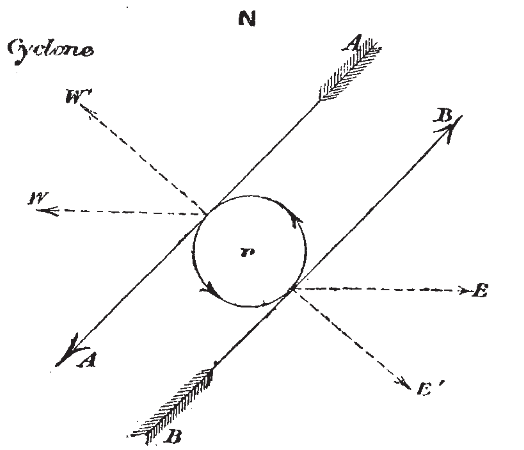
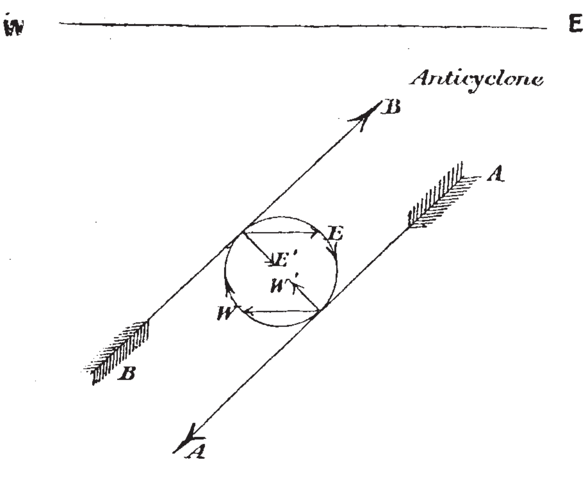
while the north-westerly current is on the north-west side, or as it is sometimes termed, the back of the storm. In the case of an anticyclone the whole thing is reversed. *The two currents pass each other on their respective right hands.* This enables the high glass on the right side of each to coincide with one another. The two winds instead of *dragging away from each other, are pushing against each other, and form a heap of air round which they*



CYCLONE.—A A, a north-east wind; B B, a south-west wind; W, westerly drift of A A due to difference of absolute velocities of earth's motion at different latitudes; W', effective part of W, in producing rarefaction at r; E', effective part of E as above. *Result*, rarefaction in centre of cyclone.



ANTICYCLONE.—*Mutatis mutandis* as cyclone. *Result*, condensation at centre of anticyclone.

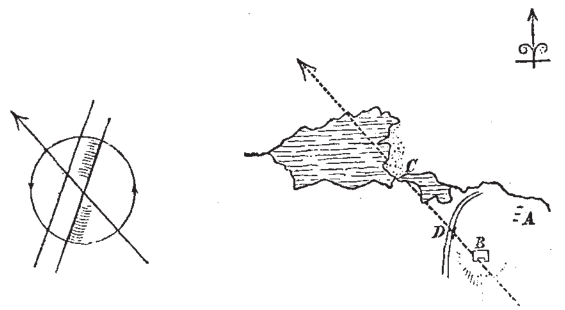
rotate, not necessarily in the opposite direction to that of the cyclone. It would be interesting to know whether an anticyclone travels from north-east to south-west. Whether it does so or not I do not know; but this is what would seem to follow if the above imperfectly-stated theory is a correct one.

EUSTACE BARHAM

Whirlwind

As meteorologists appear to be taking much interest in whirlwinds and waterspouts, you will perhaps allow me to offer you a few notes respecting a whirlwind that passed over a mountainous part of Northumberland on April 14, 1869, and left indisputable evidence of the direction in which it revolved, a fact of some importance, and one in general so difficult to ascertain, that after much research I have never yet met with a description of either whirlwind or waterspout that can be considered satisfactory in this respect.

I have long held the opinion that the smaller whirlwinds and waterspouts are of the same nature, and follow the same laws, as the greater cyclones, although Sir Wm. Reid, at p. 461, vol. i. of his "Law of Storms," is of a contrary opinion, founded on observations of waterspouts at sea, where it is extremely difficult to judge by the eye in which direction a spout is rotating. The cases where, as in America, attempts have been made to settle this point by the direction of trees thrown down by the whirlwind are very unsatisfactory; and there is nothing definite



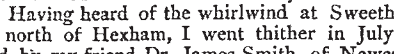
on this head to be met with in the description of upwards of three hundred whirlwinds described by Peltier in his work "Sur les Trombes."

The 14th of April, 1869, was exceedingly wild and stormy, and so dark at mid-day that we could scarcely see to write at a meeting of churchwardens in the vestry of Hexham Abbey Church. Having heard of the whirlwind at Sweethope, about ten miles north of Hexham, I went thither in July, 1869, accompanied by my friend Dr. James Smith, of Newcastle-upon-Tyne. We passed the night at Sweethope Farm (A), and examined the course of the meteor carefully. Masons were still engaged rebuilding a stable and boathouse (C) which stand at the northern extremity of the embankment that separates the larger from the smaller lake, from which issues the River Wansbeck, that flows past Morpeth, about twenty miles to the eastward.

The whirlwind was first noticed by the inmates of Mr. Robson's house, A, as it passed a small plantation on a hill at B, and was seen to travel in a north-westerly direction across the road at D, along the embankment between the two lakes, over the boathouse, C. From this point it passed a plantation of young trees, through which it cut a broad lane, and afterwards overturned a haystack.

Mr. Robson informed me, in a letter, that "trees were torn up by fifties, some broken off about midway, and carried a considerable distance in the air. Stones were turned up that would have taxed the powers of three or four strong men. Several sheep and lambs were lifted up into the air and killed by the fall; others were carried up, and, falling into the lake, were drowned. There was a tremendous thunderstorm, with forked lightning and very large hailstones. It did not travel very fast, and was like a large volume of smoke."

The boathouse was entirely unroofed and the nails drawn out of the planks of a floor of a room in the upper part of the building. The small plantation at A is 812 feet above the sea-level. Nothing was seen or heard of the whirlwind beyond the



limits of the diagram, which is copied from the Ordnance Survey Maps on the scale of an inch to a mile.

So far, the Sweethope whirlwind presented only the usual features of its class, and we were about to depart, after some good sport among the fish in the lakes, when Mr. Robson's son mentioned to me that the whirlwind, in crossing the road (at D), had thrown part of the wall into the road and another part into the field, a significant fact of which we at once proceeded to examine the details. At the point D in the diagram the wall runs in a direction nearly north by east, and has been about four feet high. At the southern end we found about two feet of the

upper part for a distance of eighteen yards thrown into the field. Then came about 9 yards of wall quite undisturbed, and afterwards thirty-six yards half down, but lying in the roadway on the opposite side of the wall. About seventeen yards of the coping-stone at the extreme northern end of the broken wall was also thrown into the road.

Fortunately the whole lay at the time of our visit just as when the whirlwind had passed, and proved conclusively that, in this case at least, the order of rotation was the same as that of the cyclones of the northern hemisphere. THOMAS DOBSON

Marine School, South Shields, June 22

Zoological Geography—Didus and Didunculus

I AM at a loss to understand how *Didunculus* can be called "a near congener" of the Dodo, as Mr. Searles V. Wood, apparently following Dr. Litton Forbes (whose paper I have not seen), terms it (*suprà*, p. 220). The two birds, so far from being congeneric, belong to perfectly distinct groups of the Order *Columbæ*, and nearly thirty years ago Bonaparte treated them as the types of distinct families—*Dididæ* and *Didunculidæ*—an example which has been generally followed by the best authorities. If Mr. Wood will refer to a paper in the *Philosophical Transactions* for 1869 (pp. 327–362) I think he will see that there is good ground for not attaching much importance to the slight and superficial characters in which *Didunculus* resembles the *Dididæ*. ALFRED NEWTON

June 30

A Subject-Index to Scientific Periodical Literature

I BEG permission to ventilate in your columns a subject which must make itself felt more or less to all your readers, viz., the want of some subject-index to the vast amount of material scattered about in the numerous scientific periodical publications of the present day. It is true we have the admirable catalogue of the Royal Society, but unless you are acquainted with the name of every author who has written on your subject, it is nearly hopeless attempting a complete bibliography of it. Now I would suggest whether an index to the Royal Society's catalogue cannot be made on the same plan that has been adopted by the committee of the new edition of "Poole's Index," viz., by getting different societies, libraries, or individuals to take certain parts of the work. The following is a short abstract of how this committee have set about their work; any of your readers who wish for further information will find it at pp. 109–206 of the "Transactions and Proceedings of the Conference of Librarians, London, 1878," and on p. 201 a short specimen may be seen. The index is made on sheets of foolscap, and the indexer has nothing to do with alphabetical arrangement; he makes his entries in the order the articles occur in the volume at which he is working; these sheets are then sent to the editors, who cut them into slips and work them into alphabetical order with the material coming in from other sources. By this method complete uniformity is maintained; for should the indexer have a peculiar idea of his own how any particular part should be done, his peculiarity is put right at the central bureau or editorial office.

I have said this should be an index to the Royal Society's catalogue, but if this scheme is ever carried into execution I would strongly urge that the index should be made from the periodicals themselves, and not from the entries in the Royal Society's catalogue, as it is absolutely impossible to index a paper properly from the title only; and another advantage is that under this plan the work could be better carried out, as each indexer could confine himself to his own branch of study; whereas if the index were made from the catalogue itself, it must be cut up into alphabetical portions, and each man would have to do a variety of subjects. This may seem to many too large a matter even for consideration, but for many years so was a good alphabetical catalogue of the different scientific papers; this has been conquered by the Royal Society, and if that learned body would constitute itself the central bureau, I think willing workers would soon be found, and the success of the index be assured. Of course all this would cost money, but surely an appeal might fairly be made to scientific societies and individuals to help in this work, which would be so great a help to the "advancement of science." JAS. B. BAILEY

Oxford

A NEW TRIUMPH OF CHEMICAL SYNTHESIS

THE year 1868 was a marked epoch in the progress of chemical synthesis as well as of tinctorial processes. The German chemists, Profs. Graebe and Liebermann, succeeded at that date in preparing from the hydrocarbon anthracene manufactured from coal tar the brilliant dyestuffs hitherto won from madder, and in establishing also the chemical constitution of these various compounds and their relationship to other well-known bodies. This was the first instance in which the chemist had succeeded in artificially preparing colours occurring in the vegetable kingdom; and although the manufacture of artificial madder colouring matters has assumed at the present day colossal proportions and bids fair to entirely supersede the preparation of the natural products, it has hitherto remained the only instance of the kind in the history of chemistry, all other vegetable and animal dyes obstinately refusing to disclose the secret of their composition and be classified among the compounds of well-defined molecular structure. Within the past few weeks the madder colours have ceased to occupy this unique position. Modern chemistry has succeeded in preparing synthetically none other than common indigo, the well-known product of the *Isatis tinctoria*, and *Nerium tinctorium* of India and South America.

This discovery is likewise due to a German chemist, Prof. A. Baeyer, the genial successor to the chair of Liebig at Munich, one of the most indefatigable and successful investigators of our day. For a score of years he has been seeking to solve the problem of the constitution of indigo and its synthetical preparation. Slowly and patiently he has gathered together and elaborated one fact after another, until finally, at the last session of the German Chemical Society, he was able to announce the completion of the long research and the discovery of the last link in the chain of synthetic reactions leading to the formation of indigo.

We will sketch briefly the various steps in this synthesis, which is not only one of the most brilliant chemical achievements of the present year, but affords an unusually interesting glimpse into the methods and aims of the modern chemist.

Indigo blue, or indigotine, possesses the formula C_8H_5NO, and, from the products of its decomposition, aniline, orthoamidobenzoic acid, &c., has long been regarded as closely allied to the benzene series. Attempts without number have been made to show the nature of this connection by starting from benzene compounds, but hitherto with fruitless results. As in the case of the alizarine compounds, where Graebe and Liebermann first found that anthracene was obtained from alizarine by reducing agents, so has the first step in the solution of the indigo problem been to study carefully the various compounds resulting from successive decompositions, each in turn yielding a body of a simpler constitution. Passing from one compound to another, Prof. Baeyer finally reached alpha-toluic acid or phenylacetic acid, $C_6H_5.CH_2.COOH$, a not uncommon body, easily prepared from cyanide of benzyl. Here he stopped, and began to retrace his footsteps.

The first reaction was to replace one of the hydrogen atoms in the phenylic group of *phenylacetic acid*,

$$\text{(A.)}\quad C_6H_5.CH_2.COOH,$$

by the group NO_2—a familiar operation effected by treatment with nitric acid—and giving, among other compounds, *ortho-nitrophenylacetic acid*,

$$\text{(B.)}\quad C_6H_4\left\langle\begin{matrix}CH_2.COOH\\NO_2\end{matrix}\right..$$

This, when reduced by nascent hydrogen—*i.e.*, submitted to treatment with a mixture of tin and hydrochloric